MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

PEM0026 – TRIGONOMETRY AND GEOMETRY

(JUNE & MARCH INTAKE)

14 OCTOBER 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **6** pages including the cover page.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary working **MUST** be shown.
4. Only **NON-PROGRAMMABLE** calculator is allowed.

APPENDIX

TRIGONOMETRY IDENTITIES

$\sin^2\theta+\cos^2\theta=1$; $\sec^2\theta=1+\tan^2\theta$; $\csc^2\theta=1+\cot^2\theta$

$\sin 2\theta=2\sin\theta\cos\theta$

$\cos 2\theta=\cos^2\theta-\sin^2\theta=2\cos^2\theta-1=1-2\sin^2\theta$

$\tan 2\theta=\dfrac{2\tan\theta}{1-\tan^2\theta}$

$\sin(A\pm B)=\sin A\cos B\pm\cos A\sin B$

$\cos(A\pm B)=\cos A\cos B\mp\sin A\sin B$

$\tan(A\pm B)=\dfrac{\tan A\pm\tan B}{1\mp\tan A\tan B}$

$2\sin A\cos B=\sin(A+B)+\sin(A-B)$

$2\cos A\cos B=\cos(A+B)+\cos(A-B)$

$2\sin A\sin B=\cos(A-B)-\cos(A+B)$

$\sin A+\sin B=2\sin\dfrac{A+B}{2}\cos\dfrac{A-B}{2}$; $\sin A-\sin B=2\cos\dfrac{A+B}{2}\sin\dfrac{A-B}{2}$

$\cos A+\cos B=2\cos\dfrac{A+B}{2}\cos\dfrac{A-B}{2}$; $\cos A-\cos B=-2\sin\dfrac{A+B}{2}\sin\dfrac{A-B}{2}$

$\sin^2\dfrac{A}{2}=\dfrac{1-\cos A}{2}$; $\cos^2\dfrac{A}{2}=\dfrac{1+\cos A}{2}$; $\tan^2\dfrac{A}{2}=\dfrac{1-\cos A}{1+\cos A}$

$\sin\dfrac{A}{2}=\pm\sqrt{\dfrac{1-\cos A}{2}}$; $\cos\dfrac{A}{2}=\pm\sqrt{\dfrac{1+\cos A}{2}}$; $\tan\dfrac{A}{2}=\pm\sqrt{\dfrac{1-\cos A}{1+\cos A}}=\dfrac{1-\cos A}{\sin A}=\dfrac{\sin A}{1+\cos A}$

Continued...

QUESTION 1 (25 MARKS)

(a) Convert the following degree measure to radian measure.

Use the value of π found on your calculator.

i. $-13° 49'$ (2 marks)

ii. $-55° 20' 54''$ (2 marks)

(b) Given the function $f(x) = 2 + 3\cos(2\pi x - 3)$.

i. Find the amplitude, period, and phase shift of the function $f(x)$. (5 marks)

ii. Find the maximum and minimum values of the function $f(x)$. (5 marks)

(c) If $\cot\theta = 7$, show that $\cot\theta + 2\cot(\theta + \pi) + 5\cot(\theta + 2\pi) = 56$. (4 marks)

(d) ABC is a triangle with $a = 4.15\,\text{m}$, $c = 5.68\,\text{m}$ and $B = 27.8°$.

Determine the remaining sides and angles of the triangle ABC using the law of sines and the law of cosines. (7 marks)

Continued...

QUESTION 2 (25 MARKS)

(a) Given that $\tan\theta > 0$ and $\csc\theta = -\frac{6}{5}$, show that $\cos\frac{\theta}{2} = -\frac{\sqrt{18-3\sqrt{11}}}{6}$.

(6 marks)

(b) If $\cos\theta = \frac{1}{3}$, θ in quadrant IV, find the exact value of $\tan\left(\theta + \frac{\pi}{4}\right)$. (4 marks)

(c) Find all real numbers of θ, in terms of π, that satisfy the equation

$\cot\theta = 2\cos\theta$ in the interval of $[0,2\pi)$. (6 marks)

(d) Prove the identity $\frac{1-\sin\theta}{1+\sin\theta} = (\tan\theta - \sec\theta)^2$. (9 marks)

Continued...

QUESTION 3 (25 MARKS)

(a) Transform the polar equation $r = -5\cos\theta + \frac{2}{r}$ into rectangular equation in the form of $(x+a)^2 + (y+b)^2 = c$.

(6 marks)

(b) Find the complex cube roots of $\sqrt{5} - \sqrt{6}\ i$. Express the answers in polar form, with argument θ in degrees $(0^\circ \le \theta < 360^\circ)$.

(9 marks)

(c) Given vectors $u = 7i + 5j - 3k$ and $v = -3i - 3j - 2k$. Find the cross product $u \times v$ and determine the angle between vectors u and v.

(10 marks)

Continued...

QUESTION 4 (25 MARKS)

(a) Find an equation of a parabola which satisfies the given conditions:

Focus is located at $(-\sqrt{5},0)$; Equation of directrix: $x=3\sqrt{5}$

(5 marks)

(b) Given an equation of circle $x^2+y^2+6x-18y+41=0$.

Find the center and radius of the circle.

(6 marks)

(c) Determine the vertices, foci and equation of asymptotes of the given hyperbola.

$$11x^2-33y^2=99$$

(6 marks)

(d) Find the center, vertices and foci of the conic section with the equation

$5(x+8)^2+2(y-2)^2=10$. Sketch the graph of the conic section.

(8 marks)

End of Paper